IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

PRINCETON DIGITAL IMAGE CORPORATION,	)))
PLAINTIFF,	)))
v.	)) CASE NO.: 1:12-CV-00779-RJS)
HEWLETT-PACKARD COMPANY, FUJIFILM NORTH AMERICA CORPORATION F/K/A FUJIFILM U.S.A., INC. AND XEROX INTERNATIONAL PARTNERS,	))))))))
DEFENDANTS.	))))))

SUPPLEMENTAL DECLARATION OF JOSEPH C. McALEXANDER III

I, Joseph C. MᶜAlexander III, submit this Supplemental Declaration pursuant to 28 U.S.C. § 1746 and declare as follows:

I.   INTRODUCTION, BACKGROUND AND EXPERTISE, AND INFORMATION CONSIDERED

1.   My name is Joseph C. MᶜAlexander III, President of McAlexander Sound, Inc., located at 101W. Renner Rd., Richardson, TX. 75082. I am an independent consultant. I previously submitted a Declaration (hereinafter "MᶜAlexander Declaration") in support of Plaintiff's Opening Claim Construction Brief at the request of Plaintiff Princeton Digital Image Corporation (hereinafter "Plaintiff" or "PDIC") in this action for consideration by this Court, the United States District Court for the Southern District of New York. I submit this Supplemental Declaration in support of Plaintiff's Responsive Claim Construction Brief. I am over eighteen years of age, and I would be competent to testify as to the matters set forth herein if I am called upon to do so.

2.   In forming my opinions, I rely on my knowledge and experience in the field and on documents and information referenced in this Declaration.

3.   I am a technical expert in the subject matter areas relevant to U.S. Patent No. 4,813,056 (hereinafter "the '056 Patent"), including statistical coding, digital signal processing, microelectronics, analog and digital circuitry, communication systems, and image and video processing, and I am qualified to reach the opinions and conclusions stated in this declaration. I earned a Bachelor of Science degree in Electrical Engineering from North Carolina State University in 1969. I have been active in several professional societies and have worked in the electronics and computer fields for over forty (40) years. I have worked in the subject matter areas relevant to the '056 Patent and consider myself to be a person having at least ordinary skill in the art (PHOSITA). Details of my education and work experience are set forth in my *Curriculum Vitae*, which is attached as Appendix A to this Declaration.

4.   I have been retained by the Plaintiff as an expert in this case. I am being compensated for my work on this case at $475 per hour. No part of my compensation is dependent upon the outcome of this case or any issue in it.

5.   In forming my opinions as set forth in this Supplemental Declaration, in addition to my knowledge and experience, I have considered the following:

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- U.S. Patent No. 4,813,056 ("the '056 Patent") and its file history;
- Reexamination file history of the '056 Patent;
- Parties' Joint Claim Construction and Prehearing Statement; and
- Declaration of Dr. Touradj Ebrahimi dated August 19, 2013 ("Ebrahimi Declaration")

6.   I have been asked to provide this Supplemental Declaration to respond to the opinions set forth in the Ebrahimi Declaration. I have also been informed that the Defendants believe that certain claims terms are not capable of being construed. I have been asked to provide my opinion regarding the manner in which a PHOSITA would understand those claim terms in the context of the '056 Patent.

II.   OPINIONS

A. Person having ordinary skill in the art

7.   Dr. Ebrahimi states at ¶ 37 of the Ebrahimi Declaration that "[a]fter reading the '056 patent and its prosecution history, it is [Dr. Ebrahimi's] opinion that a person of ordinary skill in the art in the 1987-89 time frame would have been an engineer having a masters degree in electrical engineering plus at least two years of experience in the field of digital signal compression." In my opinion, Dr. Ebrahimi requires too much of a "person of ordinary skill in the art." As I stated in my prior Declaration, I believe that a PHOSITA in 1987 (the year of filing the application that issued as the '056 Patent) would have had an electrical engineering (EE or equivalent) degree with coursework in signal processing, or alternatively two years of professional experience in communication systems, signal coding, or signal processing.

8.   Dr. Ebrahimi's requirement that the PHOSITA must have had a ***masters*** degree (e.g., MSEE) to understand this technical area is unnecessarily high. The technical area addressed by the '056 Patent concerns "encoders for encoding digital signals." '056 Patent, 1:5-6. I hold a Bachelor of Science degree in electrical engineering. In my opinion, nothing about the technology described and claimed in the '056 Patent requires coursework beyond the typical signal processing coursework that generally is offered as part of the curriculum for the Bachelor of Science degree in electrical engineering (BSEE or equivalent) in U.S. colleges and universities, or, as an alternative to signal processing coursework, two years of professional experience in communications systems, signal coding or signal processing.

9.   Although I disagree with Dr. Ebrahimi's opinion regarding the definition of the PHOSITA, the differences between his opinion and mine are not so significant that they would materially affect my opinion regarding the proper construction of the claim terms at issue.

B. Codeword v. Codewords

10.   I have reviewed Dr. Ebrahimi's opinions in the Ebrahimi Declaration regarding the terms "codeword" and "codewords." I disagree with his opinion that a PHOSITA would understand, in the context of the '056 Patent, that a "codeword" and "word" means "an indivisible unit" and that "codewords" and "words" means "more than one indivisible unit." For the reasons I explained in my previous Declaration at ¶¶ 16-18, a PHOSITA would understand that the '056 Patent uses the term "codeword" in a manner that is consistent with its ordinary meaning. That is, a codeword is simply a tool for representing data, and a PHOSITA would have understood from the '056 Patent that any convenient data representation or format can be used as a codeword depending on the task at hand. *See* McAlexander Declaration at ¶¶ 15-16.

11.   The coding scheme described in the '056 Patent involves encoding a number of signal conditions. Certain signal conditions are encoded using a statistical rule, such as a Huffman coding rule. *See* '056 Patent at 9:56-60. Certain other signal conditions (e.g., zero run length values between 36 and 239 associated with Figure 4 of '056 Patent) are encoded in a different way, using a different coding rule. This different coding rule involves forming a codeword which has a "key codeword" portion and a suffix portion. *Id.* at Abstract. In the '056 Patent, both the key codeword and the suffix portions are themselves codewords, each of which represents a certain type of information. The key codeword indicates that the signal condition is a member of a group of less frequently occurring conditions and, thus, indicates that the different coding rule is being employed. The suffix codeword indicates which particular condition it is (e.g., *one* of the zero run length values between 36 and 239), that is, identifies a particular member of the group.

12.   In my opinion, Dr. Ebrahimi takes an unduly narrow view of coding which is inconsistent with the coding scheme that is described in the '056 Patent and the understanding that a PHOSITA would have of a codeword in the context of the '056 Patent. The PHOSITA would understand that the '056 Patent describes a coding rule where a codeword is divisible into

portions that themselves can be codewords, and, further, that codewords are ultimately divisible into single bits.

13.   I also disagree with Dr. Ebrahimi where he states at ¶¶ 42-43 of the Ebrahimi Declaration that each codeword must represent "one unique state of the signal." In my opinion, this portion of Dr. Ebrahimi's definition of a "codeword" is incorrect because it is not consistent with the manner in which a PHOSITA would have understood the term in the context of the '056 Patent. The usage of "codeword" in the '056 Patent is consistent with the ordinary meaning of the term, which is not limited to "one unique state of the signal." A codeword can represent one unique signal state, but it may represent more than one unique signal state. The '056 Patent includes an embodiment which applies codewords to the difference between two signals, which is certainly not "one unique state of the signal."

14.   The ASCII coding scheme which Dr. Ebrahimi references at ¶ 42 of the Ebrahimi Declaration is one particular coding scheme, but that is not the only type of coding scheme known in the field, and it would be inappropriate to consider that every "codeword" in the field of coding must be like ASCII codewords, or that the same coding rules that apply to ASCII also apply universally to all encoding schemes. Similarly, it would be inappropriate to consider that every "codeword" must be like Huffman codewords. Dr. Ebrahimi refers repeatedly to Huffman codewords, e.g., at ¶¶ 42 and 51-53, but the claims do not recite Huffman codewords, and Huffman coding is only one type of coding.

C. The Relationships between Codewords, Prefixes, and Suffixes

15.   I disagree with Dr. Ebrahimi's opinion at ¶¶ 45-46 of the Ebrahimi Declaration that a person of ordinary skill in the art would understand that, in coding, a prefix and a suffix cannot each be a codeword. I note that Dr. Ebrahimi provides no support for this opinion and does not explain what role a suffix and a prefix would play in coding, as understood by a person of ordinary skill in the art. It is my opinion that a PHOSITA would understand that, in coding, a prefix and a suffix can also be codewords. In fact, the '056 Patent describes a coding scheme where a codeword does include a prefix portion and a suffix portion, both of which are also codewords.

16.   Dr. Ebrahimi's opinion thus is contrary to the manner in which a PHOSITA would understand these terms in the context of the specification and the prosecution history of the '056

Patent, which describe the prefix and the suffix as codewords. *See, e.g.*, '056 Patent at 3:14-15 ("include the key codeword as a prefix codeword segment"); 10:26-28 ("the first five digits of the codeword of each member of this relatively large group of codewords is the same Huffman codeword"); 10:48-50 ("That 8-bit code is added as a suffix to the n-bit codeword described above producing an m-bit codeword, e.g., a 13-bit codeword"); '056 File History at Aug. 4, 1988 Amendment, at p. 8 (suffix is a "binary codeword").

17.   Additionally, I observe that Dr. Ebrahimi's analogies to the English language are misplaced. At ¶ 45 of the Ebrahimi Declaration, Dr. Ebrahimi categorically states that a prefix in the English language cannot be a word. Obviously, that is incorrect. Although I am not claiming expertise in linguistics, I note two common counter-examples to Dr. Ebrahimi's analogies, neither of which requires linguistics expertise to perceive: "over" and "under" are words, and they are also prefixes (e.g., "overlook" and "undersea"). Similarly, at ¶ 46, Dr. Ebrahimi categorically states that a suffix in the English language is not a word, and that is also simply incorrect. "Less", "able", "scribe" and "script," are all common suffixes and are also words.

D. Structure corresponding to the "generating" and "grouping" functions

18.   I do not agree with ¶¶ 47-49 of the Ebrahimi Declaration where Dr. Ebrahimi opines that, under any of the proposed constructions for "generating" and "grouping" in claims 13 and 14, the corresponding structure must include the codewords in the Tables shown in the '056 Patent.

19.   With respect to claim 13, I disagree with Dr. Ebrahimi that any of the codewords from Tables I, II, III or IV are necessary structure for performing the function of generating (i.e., outputting) either the first or the second set of codewords. As I explained in ¶¶ 24 and 28 of my previous Declaration, the only structure needed to output codewords is the memory 200 output circuitry, which accesses storage elements to output the codewords. The codewords themselves are not the structure that perform the function of outputting.

20.   With respect to claim 14, I again disagree with Dr. Ebrahimi that all of the codewords from Tables I, II, III or IV are necessary structure for performing the function of grouping (i.e., designating as a member of a group) codewords. As I explained in ¶¶ 35 and 41 of my previous Declaration, the only structure needed to designate a codeword as a member of a group are key bit(s) in the memory 200, not all of the codewords listed in Tables I-IV.

21.   To the extent that "grouping" might be construed as "organizing in memory" (which I do not agree with), I disagree with Dr. Ebrahimi's opinion that the codewords listed in any of Tables I-IV would be necessary structure to perform the function of "organizing." In my opinion, a PHOSITA would not understand that codewords are structures that perform the function of "organizing in memory."

E. Dr. Ebrahimi's discussion of on-line and off-line methods

22.   ¶¶ 50-54 of the Ebrahimi Declaration are based on an assumption that the Court might potentially construe "generating a first set of codewords" to mean "creating a first group of codewords in memory." My opinion regarding the PHOSITA's understanding of the function of "generating a first set of codewords" in claim 13 is set forth in my previous Declaration at ¶ 22, where I explain that a PHOSITA would have understood that "generating" in the context of the '056 Patent refers to outputting codewords.

23.   Even if the Court were to construe the function of "generating" codewords in claim 13 to mean "creating" codewords (which, in my opinion, would not be correct), I cannot agree with Dr. Ebrahimi's opinion that there is no structure disclosed in the '056 Patent for "creating" codewords. In my opinion, a PHOSITA would understand that at least column 6, line 8 through column 10, line 57 and Figure 4 describe, by way of example, the technique for creating codewords for use in the encoding scheme that is described and claimed in the '056 Patent. The example codewords that are created, according to the description in column 6, line 8 through column 10, line 57 and Figure 4, are the codewords that are illustrated in Tables I-V.

24.   It is further my opinion that a PHOSITA, having read the '056 Patent, could create other sets of codewords that could be used in the '056 Patent's encoding scheme, where each set of codewords includes a first group of codewords representing the more frequently occurring signal conditions, and a second group of codewords representing the less frequently occurring signal conditions. Each set of codewords and the ratio of codewords in each group within the set could be different than the set of codewords shown in Tables I-V. The set of codewords also might include different, more, fewer or even longer codewords, depending on the type and number of conditions selected for encoding, the hardware constraints of the particular system in which the encoding scheme is to be employed, and the overall design and budget goals established for the particular application. The selection of the particular conditions and creation of the set and

grouping ratio of the corresponding codewords would be a design choice that would fall within the capabilities of the PHOSITA.

F. "more commonly occurring zero run length values and non-zero values"

25.   I have been informed that the Defendants believe that the phrase "more commonly occurring zero run length values and non-zero values" in claim 13 of the '056 Patent is ambiguous and therefore indefinite. I disagree. A PHOSITA reading the '056 Patent would have understood that the patent is directed to statistical coding, which involves a determination of how commonly conditions of a signal occur and then assigning codewords based on that determination. The PHOSITA reading the '056 Patent also would have understood that the '056 Patent is directed to a modified type of statistical encoding scheme that treats two groups of codewords in different manners based on their relative probabilities of occurrence for the purpose of reducing the lengths of the codewords. For a given set of conditions, more commonly occurring conditions are assigned to codewords in the first group to which a statistical coding rule applies. The other, less commonly occurring conditions are assigned to codewords in the second group to which a different coding rule applies. This different coding rule generally results in shorter codewords for the less commonly occurring conditions than otherwise would have been obtained if the statistical coding rule were applied.

26.   Given this context, a PHOSITA would have understood that the term "more commonly occurring zero run length values and non-zero values" are the conditions assigned to the codewords in the first group, and that these conditions statistically occur more commonly than conditions assigned to codewords in the second group. The PHOSITA also would understand that the particular placement of the dividing line between the two groups is a matter of design choice that takes into account various factors, including the number and type of conditions to be encoded, the particular statistical coding rule applied to the first group, the capabilities of available system hardware balanced against the goal of minimizing the length of the codewords, etc.

27.   The '056 Patent provides an example of a dividing line between two groups in Figure 4, which shows probability along the vertical axis and zero run length conditions along the horizontal axis.
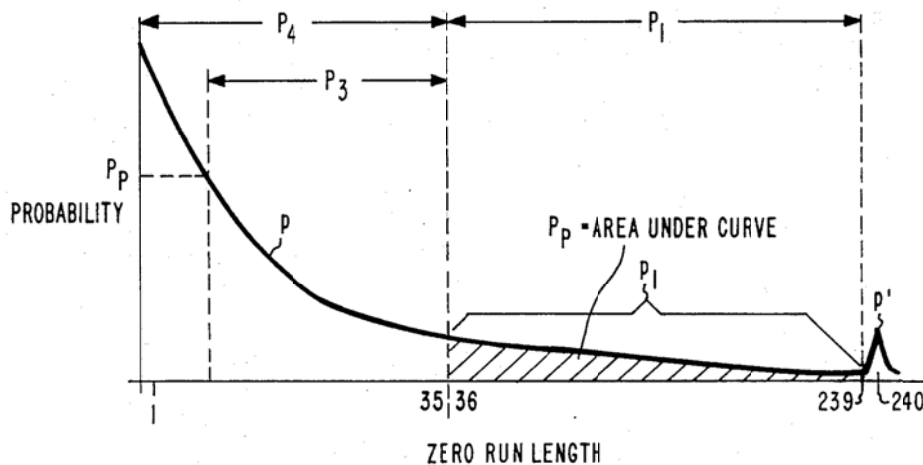
Fig. 4

28.   In Figure 4, the graphed conditions are divided into two groups, where the conditions in section P4 occur more commonly than the conditions in section P1. The '056 Patent explains that, in this example, the more commonly occurring conditions occur approximately 85% of the time, while the group probability of occurrence of the second group is about 15%.

29.   A PHOSITA would have understood that the 85%/15% division shown in Figure 4 is a matter of design choice according to standard engineering principles known to, and routinely used by, the PHOSITA. The design choice would be influenced by the particular type of application in which the encoding technique is to be employed. The PHOSITA would know that conditions may be divided into groups according to a different ratio than the ratio described in the '056 Patent and would know how to determine a ratio that would be appropriate, given the design goals and constraints of the hardware and budget of the system in which the encoding technique is employed.

30.   It is my opinion that the PHOSITA would understand the metes and bounds of this phrase in the context of the patent and, given the disclosure of the '056 Patent, would have readily understood how to design a system within the scope of claim 13 where the system includes a first group of codewords and a second group of codewords, where the first group of codewords represents the more commonly occurring signal conditions and the second set of codewords represents the less commonly occurring conditions.

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31.   Furthermore, I note that Dr. Ebrahimi shows in the Ebrahimi Declaration that this phrase ("more commonly occurring zero run length values and non-zero values") is not ambiguous and would be understood by the PHOSITA to place meaningful limitations on the scope of the claims. He uses similar terminology himself at ¶ 35 of the Ebrahimi Declaration where he acknowledges that "variants of Huffman codewords have been frequently used in which only Huffman codewords are produced for most frequent messages." Dr. Ebrahimi also admits at ¶ 41 of the Ebrahimi Declaration that a "designer of a coding system would consider a variety of factors in determining how many conditions and codewords to define and their characteristics. For example, the '056 patent points out that longer codewords should be avoided." Dr. Ebrahimi's statements are consistent with my opinion that a PHOSITA would have understood from the '056 Patent how to apply standard engineering design principles to define multiple groups of signal conditions, where the members of one of the groups are the "more commonly occurring zero run length values and non-zero values."

> **G. "a statistical rule such that the at least generally less commonly occurring words are longest and the at least generally most commonly occurring words are shortest"**

32.   I have also been informed that the Defendants believe that the phrase "a statistical rule such that the at least generally less commonly occurring words are longest and the at least generally most commonly occurring words are shortest" in claim 13 is ambiguous and thus indefinite. I disagree. As I have discussed above, the '056 Patent describes a statistical coding scheme; and statistical coding was well understood by the PHOSITA in 1987.

33.   The understanding of the PHOSITA is reflected in the specification of the '056 Patent, which describes statistical coding as a technique that uses "codewords of variable bit length, which are chosen so their length is inversely related to the frequency that … they … tend to be selected." '056 Patent at 1:50-54. Exemplary codewords, to which a statistical coding rule has been applied, are illustrated in statistical order in Table V showing that the at least generally most commonly occurring words are shortest, and that the at least generally less commonly occurring words are longest. In the example of Table V, multiple codewords have the same length of 10 although their individual probabilities of occurrence are not the same. Multiple codewords having the same length illustrate the concept that the "at least generally less commonly occurring" codewords have the longest length.

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34.   In view of this clear description and examples of known statistical coding rules in the '056 Patent, it is my opinion that this phrase would have been readily understood by the PHOSITA at the time of the invention. *See* '056 Patent, at 1:51-54 ("length [of codewords] is inversely related to the frequency that the bins they describe tend to be selected during the classification into range bins.").

35.   I note that Dr. Ebrahimi uses similar terminology in the Ebrahimi Declaration to describe a statistical coding technique, providing further support to my opinion that this phrase is not ambiguous. Specifically, Dr. Ebrahimi states at ¶ 34 of the Ebrahimi Declaration that "[t]he idea behind entropy coding is to assign shorter codewords (in number of bits) to messages that occur more often."

> **H.   "a first group of said codewords being organized statistically in a first given order in which at least generally the shortest codeword length manifests that signal condition having the greatest probability of occurrence and at least generally the greatest codeword length manifests that signal condition having the lowest probability of occurrence"**

36.   I have also been informed that Defendants believe that this phrase, which appears in claim 18, is ambiguous and therefore indefinite. I have been informed that Defendants' reasoning presents the same arguments that Defendants presented for the terms that I addressed above in sections F and G of this Supplemental Declaration. I, therefore, rely on and incorporate my opinions as set forth above in sections F and G. For those reasons, it is my opinion that, a PHOSITA reading the '056 Patent would have understood the meaning and scope of the above-listed claim term "a first group of said codewords . . . lowest probability of occurrence" which appears in claim 18.
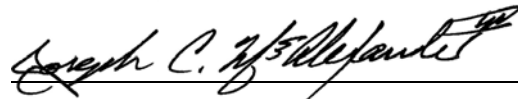
> **I.   "a second group of different codewords having a codeword portion length such that the combined probability of occurrence value of all of the signal conditions represented by the second group is organized statistically with said first given order codeword length based on said combined probability value regardless the relative codeword lengths of said second group codewords as compared to the codeword length of the next adjacent codewords of the first group"**

37.   I have also been informed that Defendants believe that this phrase, which appears in claim 18, also is ambiguous and, therefore, indefinite. I have been informed that Defendants' reasoning presents the same arguments that Defendants presented for the term that I addressed above in section H of this Supplemental Declaration. I, therefore, rely on and incorporate my

opinions as set forth above in section H. For those reasons, it is my opinion that, a PHOSITA reading the '056 Patent would have understood the meaning and scope of the above-listed claim term "a second group of different codewords . . . next adjacent codewords of the first group" which appears in claim 18.

I declare under penalty of perjury under the laws of the State of Texas that the foregoing is true and correct.

Executed on September 16, 2013.

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Joseph C. McAlexander III